

SECTION I: Pre-Approval Zones

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OVERVIEW

PRE-APPROVAL ZONES

Purpose and authority

This document outlines the Dispersant Use Plan for state and federal marine waters within the Region IX Regional Response Team (RRT) area of operations.

This policy authorizes and provides guidelines to allow the federally pre-designated U. S. Coast Guard (USCG) Federal On-Scene Coordinator (FOSC) and/or the Unified Command to use dispersants in a timely manner to: 1) prevent or substantially reduce a hazard to human life; 2) minimize the adverse environmental impact of the spilled oil; and 3) reduce or eliminate the economic or aesthetic losses of recreational areas. This dispersant use plan will address the use of dispersants for each of two zones: Dispersant Pre-Approval Zones; and, RRT Approval Required Zones.

Subpart J of the National Contingency Plan (NCP) provides that the FOSC, with the concurrence of the EPA representative to the Regional Response Team and the State with jurisdiction over the navigable waters threatened by the oil discharge, and in consultation with the U.S. Department of Commerce (DOC) and U.S. Department of the Interior (DOI) natural resource trustees, when practicable, may authorize the use of dispersants on oil discharges; provided, however, that such dispersants are listed on the NCP Product Schedule. The EPA has been delegated authority to maintain a schedule of chemical countermeasures that may be authorized for oil discharges in accordance with procedures set forth in **Section 300.900 of the NCP**.

The USCG Eleventh District Commander has pre-designated the three USCG Captains of The Port (COTP) as the FOSCs for oil discharges in their respective COTP zones (as defined in 33 CFR Part 3 and subject to joint response boundary agreements with EPA described in Section 1400 of the three California Area Contingency Plans), and has delegated to each COTP the authority and responsibility for compliance with the Federal Water Pollution Control Act (FWPCA).

The Governor of the State of California has designated the Administrator of the Department of Fish and Game Office of Oil Spill Prevention and Response (CDFG-OSPR) the authority and responsibility for providing approval for the use of dispersants for control of oil spills in or affecting California waters.

The USCG, EPA, DOI, DOC/NOAA, and CDFG-OSPR agree that one of the primary methods of controlling discharged oil shall be the physical removal of the oil by mechanical means. These agencies recognize that in certain instances timely, effective physical containment, collection and removal of the oil may not be possible, and the use of dispersants, alone or in conjunction with other removal methods, may be considered to minimize substantial threat to public health or welfare, or minimize serious environmental damage. This document establishes the policy under which dispersants listed on the NCP Product Schedule may be used in Federal waters off California by FOSCs.

The response planning process

The National Oil and Hazardous Substances Pollution Contingency Plan (**National Contingency Plan –**

NCP) directs the RRTs and Area Committees to address, as part of their planning activities, the desirability of using appropriate dispersants, surface washing agents, surface collecting agents, bioremediation agents, or miscellaneous oil spill control agents listed on the NCP Product Schedule, and the desirability of using appropriate burning agents. Regional Contingency Plans and Area Contingency Plans shall, as appropriate, include applicable authorization plans and address the specific contexts in which such products should and should not be used (40 CFR § 300.910). Additional information on how this plan was directed and developed is included in Appendix I.

What is in the California Dispersant Plan (CDP)

In its current form, the CDP includes an updated Federal On-Scene Coordinator (FOSC) checklist, and a series of discussion and decision boxes to facilitate the FOSC decision. To provide the greatest likelihood that this CDP will not only train but serve the Coast Guard regardless of which personnel are in the FOSC position in the future, it includes a number of appended materials that put oil, dispersant, natural resource and response resource information close at hand in one document. The CDP also includes a number of blank forms that can be removed, duplicated as needed, and used in the field during a spill response to provide orderly and timely information to the FOSC as the spill unfolds and a decision whether or not to use dispersants becomes imminent. Other report forms document bird and mammal presence, dispersant application methods, and dispersant effectiveness.

This document is not a lengthy discussion of the relative merits of any response tool, of dispersant or dispersed oil toxicity, or the details of Net Environmental Benefit Analyses (although key points on several of these topics is embedded in the Discussion Notes on the FOSC checklist, or in the appendices). It is not a primer on oil spill response in general, or the Incident Command System. All this information is available from other resources, much of which was considered in developing the zone recommendations and CDP. This CDP instead assumes that an oil spill has occurred and all agency notifications have been made, various response agencies are on scene and using the Incident Command System to structure the response, and that dispersant use is under active consideration by the FOSC. This CDP takes over from there, offering tools to the FOSC to guide that decision.

This CDP primarily focuses on the federal offshore waters that have been designated as “pre-approved” for dispersant use. To date, this includes the waters 3 – 200 nautical miles from shore, not within a National Marine Sanctuary, and not within 3 miles of the California-Oregon border or the California-Mexico border. This CDP also addresses waters closer than 3 miles from shore, within a National Marine Sanctuary, and within 3-miles of the California-Oregon or California-Mexico borders, under the RRT Approval Process.

This CDP is a central, portable repository of all information that will guide the FOSC in a dispersant-use decision for pre-approval areas in federal offshore waters, regardless of which COTP pre-approval area the spill occurs and for which dispersants are being considered.

Quick Guide to Forms, Worksheets and Checklists

The CDP is designed primarily to assist the FOSC in making a dispersant use decision at the time of an incident. Many forms, worksheets, and checklists are included as a part of the CDP to facilitate information gathering, decision-making and providing supporting documentation, as necessary. These worksheets and forms should assist the Unified Command in making a dispersant use decision, not hinder the process with unnecessary paperwork.

As a part of the dispersant pre-approval zone decision-making process, please use the quick guide to forms, worksheets and checklists outlined below.

1) Dispersant Assessment Worksheet

Not Required by RRT

This document was designed to assist in the gathering and organization of pertinent information necessary to make a dispersant use decision.

2) Pre-Approval Zone Dispersant Use Checklist

Required by RRT

This checklist was designed to provide an overview of the pre-approval decision-making process and to provide a “dispersant decision summary” for the Incident, detailing the decisions made. Once this form is completed and the FOSC decides to use dispersants, the checklist should be faxed to the RRT as soon as feasible.

3) Checklist Documentation and Support Form Boxes #1 - #12

Not Required by RRT

This form was designed as a support tool to evaluate the information required in the pre-approval zone dispersant use checklist. This form guides the user through each decision-making point, allowing evaluation of each question that is a part of the dispersant use decision-making process. This form also cross-references the appendices, as needed, where additional information can be found.

DISPERSANT ASSESSMENT WORKSHEET

(Two pages)

Information gathered to complete this form will facilitate the dispersant pre-approval use determination; complete as much as possible without inadvisably delaying a dispersant use decision.

This report made by: _____ Organization: _____ Date: _____ Time: _____
Phone: () _____ Fax: () _____ Mobile: () _____ Pager: () _____

On-Scene Commander: _____ Agency: _____
Phone: () _____ Fax: () _____ Mobile: () _____ Pager: () _____

Caller: _____ Organization: _____ Date: _____ Time: _____
Phone: () _____ Fax: () _____ Mobile: () _____ Pager: () _____
Street: _____ City _____ State _____ Zip Code _____

OES Control # _____ NRC # _____

SPILL

Date of spill: _____ (month/day/year)	Time of spill: _____ (PST, 24-hr clock)
Location: Latitude: _____ N	Longitude: _____ W
Spill source and cause: _____ _____	
Amount spilled: _____ (gal or bbl)	Type of release: <input type="checkbox"/> Instantaneous <input type="checkbox"/> Continuous
Flow rate if continuous flow (estimate): _____	
Oil name: _____	API: _____ Pour point: _____ (°F)
Information source: _____	

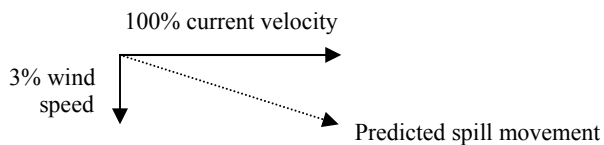
ON-SCENE WEATHER, CURRENTS AND TIDES

(If not immediately available contact NOAA Scientific Support Coordinator (206-321-3320) or other resources noted in Appendix A).

Wind (from) direction: _____	Next low tide: _____ (ft) at _____ (hrs)
Wind speed: _____ (knots)	Next high tide: _____ (ft) at _____ (hrs)
Current velocity: _____ (kts)	Current (to) direction: _____ (°true/magnetic)
Predicted slick speed: _____ (kts)	Predicted slick direction: _____ (°true magnetic)
Visibility: _____ (nautical miles)	Ceiling: _____ (feet) Sea state: _____ (wave height in feet)
Information source: _____	

PREDICTING SPILL MOVEMENT

Plot spill movement on appropriate nautical chart. Using the information from the box above, predict slick direction and speed using 100% of current velocity and 3% of wind speed.



Estimated distance to shore/sensitive area: _____ (nm)
Estimated time to shore/sensitive area: _____ (hrs)

ESTIMATING OIL SPILL VOLUME

Extent of spill:

- (a) Length of spill _____(nm) x Width of spill _____(nm) = Total spill area _____(nm²)
- (b) Estimate what proportion (%) of the total spill area is covered by oil: _____ (Express as decimal, % x 100)
- (c) Estimate slick area: $\frac{\text{Total slick area (a)}}{\text{\% oil cover (b)}} = \text{Estimated slick area}$

Estimated spill volume:

You can make this estimate using any of the following approaches:

- Get a thickness estimate from the ADIOS oil weathering model (call the NOAA SSC (206-321-3320) for assistance);
- Generate your own volume estimate of spilled oil and the area it covers (convert both volume and area to metric units and then divide the volume by the area to estimate the thickness. Use the unit conversions found in Appendix K). Convert thickness to millimeters to use Appendix D.1).
- Use your knowledge of the approximate number of barrels of oil or emulsion per acre of slick.

POTENTIAL RESOURCE IMPACTS

Using the predictive spill and weather information from the boxes above, ADIOS, the NOAA SSC, other RRT trustee agencies, aerial wildlife observers and regional resource information noted in **Appendix B**, briefly describe potential coastal areas and resources that could be impacted from this spill.

DISPERSANT SPRAY OPERATION

Information from **Appendices C.5 – C.8 and D.1** will be helpful.

Dispersant spray contractor name: _____		Street: _____
Dispersant name: _____	Quantity available: _____	City: _____
		State: _____ Zip Code: _____
		Phone: () _____
Platform: Aircraft type: <input type="checkbox"/> Multi-engine <input type="checkbox"/> Single-engine		
Boat type: _____		
Other: _____		
Dispersant load capability (gal): _____		
Estimate:		
“Window of opportunity” for getting dispersant on the oil (App.) _____ (hrs from first report of spill)		
Number of daylight hours available for first day of dispersant application: _____ (hrs from first report of spill)		
Time to first drop on the oil: _____ (hrs from first report of spill)		
Can dispersants to be effective after day one of the spill?		YES / NO / Cannot determine at this time (circle one)
Note: It might be appropriate to conduct a small dispersant test before proceeding to a full application.		

PRE-APPROVAL ZONE DISPERSANT USE CHECKLIST

Oil Spilled

1a
1

Request SMART (App. D.4-D.8)

1b
1

Put aerial wildlife observers on standby or deploy to implement *Wildlife Spotting Protocols* (App. E) or other protocols deemed appropriate by the FOSC.

1c

Implement other response options

2

Can spilled oil be chemically dispersed with an approved and available agent on both the NCP Product List and the State OSCA licensing list? (Note 2.1, App. C, App. H, App. J)

3

Are oceanographic and/or weather conditions potentially conducive to dispersant use? (App. J)

4

Is the spilled oil proposed for dispersant treatment at least 3 miles from shore, 3 miles from CA/OR or CA/Mex. borders, and not within NMS boundaries?

4a

Pre-approval does not apply. Refer to incident-specific RRT Approval Process (Section II)

5

Can dispersant be applied safely from an appropriate platform? (App. C.5-C.8)

5a
5b

Dispersant operations on standby

5b

Weather unlikely to improve or suitable response resources not available

6a
6

Initiate *Public Communications Plan* (App. F)

6b
6

Implement *Seafood Tainting Plan* if necessary (App. G)

7a
7

Regional sensitive species and habitat information from NEBA (Note 7.1, App. B)

7b
7

Marine animal information from aerial wildlife spotters (App. D.9, App. E), and any other marine animal information available to the FOSC.

8

FOSC should evaluate present conditions for exceptions to environmental tradeoffs (NEBA)

8

Apply dispersants and inform RRT (fax Decision Summary on this page to contacts in App. A)

9
9

Are there indications the dispersant is effective? (Notes 9.1, 9.2, App. D)

10
10

Is ongoing dispersant use justified and safe?

11
11

Continue to monitor application parameters, and run additional dispersant sorties as necessary. Inform RRT when all runs are completed (fax this form to RRT contacts in App. A). Determine if other response options are still available and appropriate (App. D.4).

12

Do not use dispersant

Pre-Approval Zones

Dispersant Decision Summary

Spill location: _____

Decisions approved by: _____

Box	Decision	Time:	Date:	Initials:
1	Yes/No	_____	_____	_____
2	Yes/No	_____	_____	_____
3	Yes/No	_____	_____	_____
4	Yes/No	_____	_____	_____
5	Yes/No	_____	_____	_____
6	Yes/No	_____	_____	_____
7	Yes/No	_____	_____	_____
8	Yes/No	_____	_____	_____
9	Yes/No	_____	_____	_____
10	Yes/No	_____	_____	_____
11	Yes/No	_____	_____	_____
Run 2 _____				
Run 3 _____				
Run 4 _____				
Run 5 _____				
Run 6 _____				
Oil Spilled				
12	Do not use	_____	_____	_____

Supplemental Decisions:

1a Yes/No _____

1b Yes/No _____

5a Yes/No _____

5b Yes/No _____

6a Yes/No _____

6b Yes/No _____

7a Yes/No _____

7b Yes/No _____

Comments:

The following boxes and checklists are to support decision-making. Complete as appropriate given time and information constraints. Do not allow completing each check-box to inadvisably delay decision-making.

BOX 1

IS DISPERSANT USE BEING CONSIDERED?

Dispersant use should be considered if one or more of the situations listed below exist:

- ☐ Oil is likely to significantly impact birds, marine mammals, or other flora and fauna at the water surface
- ☐ Natural dispersion is limited
- ☐ Other response techniques are unlikely to be adequate, effective, or economical
- ☐ The oil could emulsify and form mousse or tar balls
- ☐ Oil is likely to significantly impact shorelines, structures and facilities (e.g., marinas, wharves)
- ☐ Oil is likely to significantly impact economically important resources (e.g., shellfish beds, tourist beaches)
- ☐ Other

Decision: Consider dispersant use?

- ☐ Yes Make notifications in **Box 1a**
Make notifications in **Box 1b**
- ☐ No Go to **Box 1c**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

From Cawthron, 2000

Discussion Note 1.1

KEY BENEFITS OF DISPERSANT USE

- Dispersant use minimizes the effects of an oil spill principally by dispersing oil before it reaches shorelines or sensitive areas (e.g., wetlands, estuaries).
- Removing oil from the surface of the water reduces the potential for impacts to birds and marine mammals, and limits the action of wind on spill movement.
- Dispersants can prevent oil from sticking to solid surfaces, and enhance natural degradation.
- Dispersants can effectively treat large spills more quickly and inexpensively than most other response methods.
- Dispersants can be effective in rough water and strong currents where mechanical responses are limited.
- Effective dispersant responses can greatly reduce the quantity of oil requiring recovery and disposal.
- Dispersant use is often the only feasible response to spills that exceed mechanical response capabilities.
- Dispersant use does not generally limit other options, except oleophilic mechanical responses.
- Dispersed oil that cannot be mechanically recovered generally poses few significant environmental problems.

From Cawthron, 2000

BOX 1a

REQUEST SMART

Immediately deploy USCG Strike Team to the spill site if dispersant use is likely. Every attempt should be made by the FOSC and the Strike Team to implement the on-water component of the SMART (Special Monitoring of Advance Response Technologies) monitoring protocols in every dispersant application. **Dispersant application should not be delayed should sea conditions, equipment failure, or other unavoidable circumstances preclude the positioning of SMART monitoring equipment and personnel.** However, at a minimum, Tier 1 (visual) monitoring should occur by trained observers during any dispersant operation approved in accordance with this California Dispersant Plan. Tier 2 (on-site water column monitoring) and Tier 3 (fate and transport of the dispersed oil) SMART monitoring will be deployed as appropriate. Other information on monitoring dispersant effectiveness, including additional SMART background information, tools and report forms, is presented in **Appendices D.4 – D.8**.

Decision: Deploy SMART?

- ☐ Yes Use contact information in Appendix A. **Estimated arrival time:**
Go to **Box 1b**.
- ☐ No Note reason why not deployed.

Make a note of the decision on Dispersant Use Checklist (Page I-8)

Go to **Box 1b** or **Box 1c** as appropriate.

BOX 1b**PUT AERIAL WILDLIFE OBSERVERS ON STANDBY OR DEPLOY TO IMPLEMENT THE WILDLIFE SPOTTING PROTOCOLS**

Consider deploying trained wildlife spotters in initial spill overflight aircraft so that they can determine if the presence of marine animals in the spill or dispersant application zones could influence spray pattern decisions by the FOSC. The goal is to minimize over-spray onto unaffected animals. Wildlife spotters should use the forms and procedures given in the *Wildlife Spotting Protocols* (**Appendix D.9 and Appendix E**). The FOSC will decide how subsequent and systematic wildlife spotting efforts can be safely conducted with the aerial resources available.

Decision: Notify/deploy aerial wildlife spotters?

- ☐ Yes Use wildlife spotter contact information in **Appendix E.2**. Go to **Box 2**.
☐ No Note reason why wildlife spotters not deployed

Make a note of the decision on Dispersant Use Checklist (Page I-8)

Reconsider under **Box 7**.

BOX 1c**IMPLEMENT OTHER RESPONSE OPTIONS**

Consider all response options to identify which option, or combination of options, is most appropriate. The following options are described in the Area Contingency Plan (**Section 1640**) and the Regional Contingency Plan (**Section 1007.05**).

- | | |
|----------------------------------------------------------------------------|----------------------------------------------------------|
| <input type="checkbox"/> No action other than monitoring | <input type="checkbox"/> Clean-up of oil from shorelines |
| <input type="checkbox"/> Mechanical containment and recovery of oil at sea | <input type="checkbox"/> <i>In situ</i> burning |

From Cawthron, 2000

BOX 2**CAN SPILLED OIL BE CHEMICALLY DISPERSED WITH AN APPROVED AND AVAILABLE AGENT ON BOTH THE NCP PRODUCT LIST AND THE STATE OSCA LICENSING LIST?**

A NCP Product List may be found in **Appendix H**. Updated NCP Product Lists can be accessed via the EPA representative on the RRT (**Appendix A**), by calling the Emergency Response Division of the U.S. EPA (202-260-2342) or accessing the Internet at <http://www.epa.gov/oilspill/ncp/dsprnts.htm>

The State OSCA licensed dispersants may also be found in **Appendix H** or by calling the State OSPR representative on the RRT (**Appendix A**).

Decision: Can this oil be dispersed with an approved and available agent?

- ☐ Yes Go to **Box 3**.
☐ No Go to **Box 1c**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

Taken in part from Cawthron, 2000

Discussion Note 2.1**OIL DISPERSIBILITY (Also see App. ___ for Window of Opportunity)**

Three types of oils are typical of those produced or transported in California offshore waters: a) crude oils produced in California Outer Continental Shelf (OCS) waters; b) oils imported from Alaska and foreign countries into California ports; and c) fuel oils that could be spilled from a variety of marine industrial activities (*e.g.*, fuel tanks from ships, cargoes of small tankers). Dispersants only work if the spilled oil has a relatively low viscosity at the time of treatment.

Appendices C.1 and C.2 show the California platform-produced oils and tankered oils, respectively.

Most oils produced from offshore platforms are heavy, and border on the range of oils that are considered to be difficult or impossible to disperse. The oils transported by tanker include two-three dozen different types of oil (only the most common are listed in **Appendix C.2**). The most important is Alaska North Slope crude, which represents 50% of each annual total. Based on API gravity information, these oils appear to be dispersible when fresh.

- The most important criterion for dispersant use is whether the oil is dispersible.
- The best indication of oil dispersibility is from specific oil weathering and dispersion data from field trials (see **Appendix C.3** for some tested and modeled oils).
- Potential dispersibility can be *estimated* from physical properties of oils, under different oil weathering and spill scenarios (*e.g.*, ADIOS, Table 2.1 below). The ADIOS computer database predicts oil dispersion based on physical and chemical properties of spilled oil under specified spill conditions.
- Dispersant use should not be rejected exclusively on the basis of predictive models.

Generally, if: (get box/matrix from Jason)

- Oil is able to spread on the water, it is likely to be dispersible.
- Viscosity is 2000 cSt, dispersion is probable.
- Viscosity is >2000 cSt, dispersion is possible.
- Viscosity is >5000 cSt, dispersion is possible with concentrated dispersant (*e.g.*, Corexit 9500).
- Sea temperature is >10° C below oil pour point, dispersion is unlikely.

Potential dispersion may also be assessed using tables in Appendix C.

Limitations of predicting dispersion:

- Using generic values of viscosity and/or pour point to predict dispersion (*e.g.*, ADIOS, **Appendices C.3 and C.4**) can underestimate the potential for oil to be dispersed.
- Most models are based on limited oil weathering, emulsification or dispersion data, therefore estimated windows of opportunity may be inaccurate.

Taken in part from Cawthron, 2000 and S.L. Ross, 2002

Table 2.1

ADIOS (AUTOMATED DATA INQUIRY FOR OIL SPILLS) COMPUTER DATABASE

Use the **DISPERSANT ASSESSMENT WORKSHEET** and the NOAA SSC (206-321-3320) for the information needed by ADIOS, or use the form below. The NOAA SSC should also be able to assist with ADIOS.

Copies of ADIOS are available from the NOAA website:

<http://response.restoration.noaa.gov/software/adios/adios.html>

Oil/product name: _____	Wind speed: _____ (knots)
Amount spilled: _____ (gal or bbl)	Wave height: _____ (m)
Type of release: _____	Water temp.: _____ (°C)
<input type="checkbox"/> Instantaneous <input type="checkbox"/> Continuous	Water salinity: _____ (ppt)

Important limitations on the use of ADIOS: ADIOS predicts dispersibility based on estimates of oil properties (including emulsification) under different conditions. As emulsification data are scarce, **predicted rates of dispersion may be different than actual rates of dispersion**. ADIOS is intended for use with floating oils only, and does not account for currents, beaching or containment of oil. ADIOS is unreliable for very large or very small spills. It is also unreliable when using very high or very low wind speeds in modeling the spill.

From Cawthron, 2000

BOX 3**ARE OCEANOGRAPHIC AND/OR WEATHER CONDITIONS POTENTIALLY CONDUCTIVE TO DISPERSANT USE?**

Does the available technical information indicate that the existing oceanographic (*e.g.*, surface current direction and speed, wave and chop height) and weather (*e.g.*, wind direction and speed, visibility, ceiling height) conditions are suitable for a successful dispersant application?

Use the following resources:

- ☐ Information on the DISPERSANT ASSESSMENT WORKSHEET
- ☐ Consultation with the NOAA Scientific Support Coordinator (206-321-3320)
- ☐ Information resources and web sites noted in **Appendix A**
- ☐ Information from aerial overflights
- ☐ Information from ADIOS

Decision: Are ocean and weather conditions potentially suitable for a dispersants application?

- ☐ Yes Go to **Box 4.**
- ☐ No Go to **Box 1c**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

BOX 4**IS THE SPILLED OIL PROPOSED FOR DISPERSANT TREATMENT AT LEAST 3 MILES FROM SHORE, NOT WITHIN NMS BOUNDARIES, AND NOT WITHIN 3 MILES OF THE CA/OR OR CA/MEXICO BORDER?**

A full-page statewide chart indicating the area three nautical miles from shore and the areas within National Marine Sanctuaries (Gulf of the Farallones, Cordell Banks, Monterey, Channel Islands) is in Chart 4.1 below. Regional charts, with pre-approval dispersant zones noted, are in **Appendix B**.

Decision: Is the spilled oil within a Pre-Approval zone?

- ☐ Yes Go to **Box 5.**
- ☐ No Pre-Approval does not apply. Go to **Box 4a.**

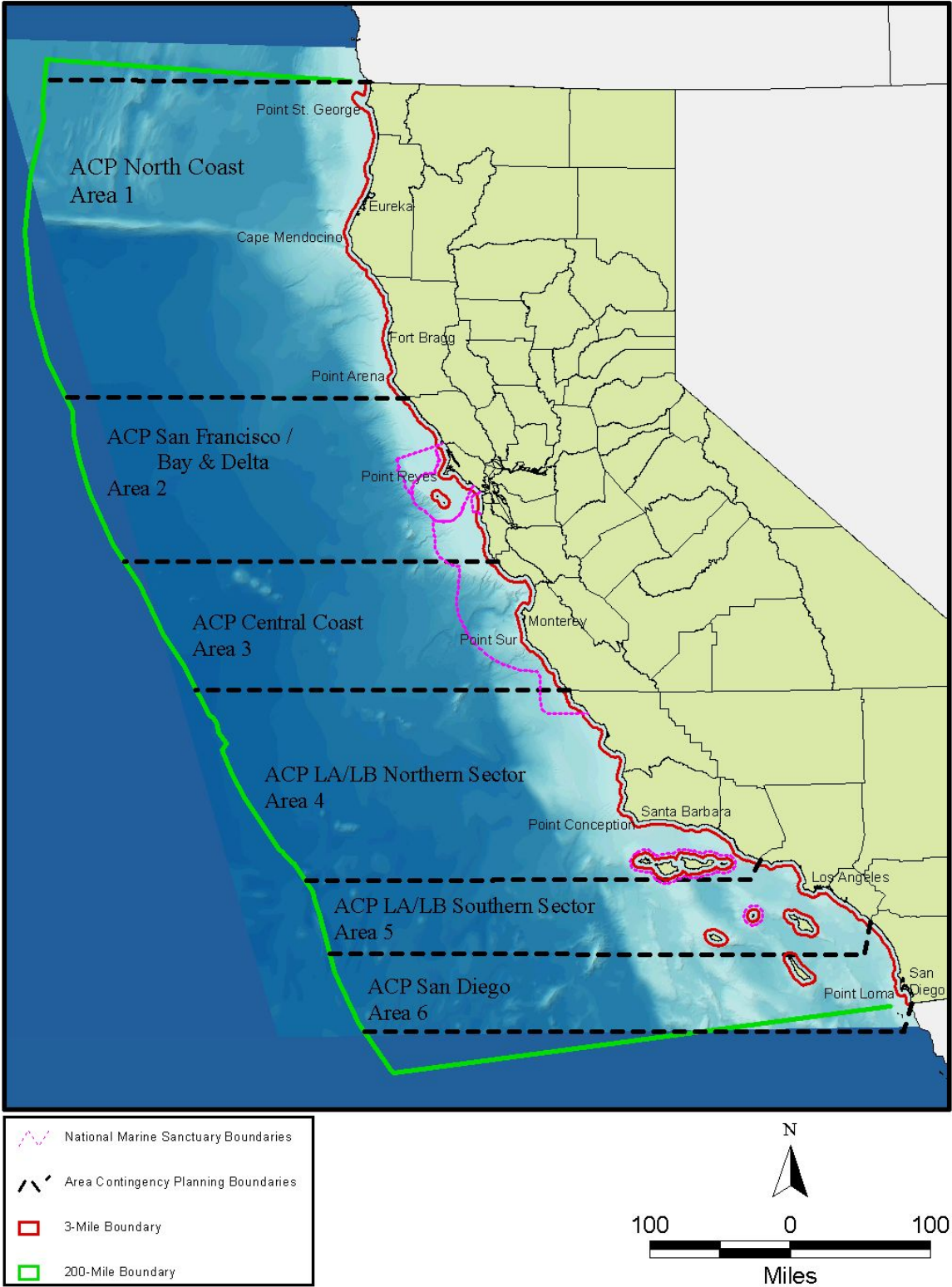
Make a note of the decision on Dispersant Use Checklist (Page I-8)

BOX 4a**PRE-APPROVAL DOES NOT APPLY; REFER TO RRT APPROVAL PROCESS.**

The request for dispersant use does not qualify under the pre-approval guidelines for the use of dispersants in RRT Regional IX. Contact the NOAA SSC (206-321-3320) and begin the dispersant *RRT Approval Process*, **Section II**.

Chart 4.1

California Marine Waters Pre-Approval Dispersant Zone



BOX 5**CAN DISPERSANT BE APPLIED SAFELY FROM AN APPROPRIATE PLATFORM?**

Use the information in the **DISPERSANT ASSESSMENT WORKSHEET** to evaluate which application platform(s) will be most effective, given the following particular considerations:

- The amount of oil spilled;
- The location of the operational area;
- The volume of available dispersants;
- The timeframe in which the required equipment can be on-scene.

Assume for planning purposes that the weather information on the **DISPERSANT ASSESSMENT WORKSHEET** will remain the same during the timeframe in which this decision is operating. At the earliest opportunity, contact the NOAA SSC (**206-321-3320**) for more detailed and updated weather information, but do not delay this decision process for the NOAA SSC weather input. Weather information may also be available from resources noted in **Appendix A**. See **Appendices C.5 – C.8** for specific information on dispersant application platforms.

Decision: Is there a safe and appropriate application platform for a dispersant operation?

(See Discussion Note 5.2 below for important safety information)

	Yes	(Type)	No	(Why not appropriate?)
C-130/ADDS Pack	<input type="checkbox"/>		<input type="checkbox"/>
DC-4	<input type="checkbox"/>		<input type="checkbox"/>
Other large multi-engine airplane	<input type="checkbox"/>	<input type="checkbox"/>
Cessna AT-802	<input type="checkbox"/>		<input type="checkbox"/>
Other single-engine airplane	<input type="checkbox"/>	<input type="checkbox"/>
Helicopter	<input type="checkbox"/>	<input type="checkbox"/>
Work boat	<input type="checkbox"/>	<input type="checkbox"/>
	Go to		Go to	
	Box 6		Box 5a and/or 5b	

Make a note of the decision on Dispersant Use Checklist (Page I-8)

Taken in part from Cawthron, 2000 and S.L. Ross, 2002

Discussion Note 5.1 CURRENT LOGISTICS FOR A CALIFORNIA DISPERSANT APPLICATION

Use the information on the **DISPERSANT ASSESSMENT WORKSHEET** to consider the following:

- ☐ Is the selected dispersant available in the quantity needed?
- ☐ Can the estimated “window of opportunity” for getting the dispersant on the oil be met?
- ☐ Can the dispersant and application resources get to the spill scene on time?
- ☐ Will there be enough daylight hours for an effective dispersant application?

Refer to **Appendix C** for more specific regional dispersant resource information.

Discussion Note 5.2**GENERAL SAFETY ISSUES**

- The FOSC is responsible for ensuring that health and safety requirements are adequately addressed during a response.
- Individuals should not engage in activities that they are not appropriately trained to perform.
- Individuals are expected to adhere to safety procedures appropriate to the conditions they are working under and/or are included in a dispersant-specific Site Safety Plan Annex.
- Vessel/aircraft operators are expected to define appropriate operational limits and safety and maintenance requirements for their craft.
- Vessels and response resources should be properly maintained and undergo proper decontamination procedures.
- Apply dispersants only if there is no significant risk to response personnel (*e.g.*, ignition risk, operational hazards).
- Ensure the appropriate personal protective equipment (PPE) is available.
- Ensure that application aircraft and vessels remain within standard operating limits.
- Each person involved in a response is required to take personal responsibility for his or her safety. The FOSC may appoint a Safety Officer and request development of a specific Site Safety Plan Annex. Key safety aspects to be considered in the plan may include:
 - Physical hazards (*e.g.*, waves, tides, unstable or slippery surfaces)
 - Heavy machinery and equipment
 - Chemical hazards (*e.g.*, oil and dispersant exposure)
 - Atmospheric hazards (*e.g.*, fumes, ignition risks)
 - Confined spaces
 - PPE
 - Noise
 - Fatigue
 - Heat/cold stress
 - Wildlife (bites/stings)
 - Cleanup facilities
 - Medical treatment

HUMAN SAFETY OVERRIDES ALL OTHER CONSIDERATIONS DURING A RESPONSE

From Cawthron, 2000

BOX 5a**DISPERSANT OPERATIONS ON WEATHER STANDBY**

Consult with appropriate RRT IX members (USCG/District 11 Co-Chair, EPA, DOI, DOC and OSPR (See **Appendix A** for contact information) to notify them that dispersants are being considered, but delayed due to weather.

Decision: Has the weather improved to the point where dispersants can be applied?

- ☐ Yes Go to **Box 6**
- ☐ No Continue to **reassess** (until/unless time window for successful application closed) or Go to **Box 5b**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

BOX 5b**WEATHER UNLIKELY TO IMPROVE OR
SUITABLE RESPONSE RESOURCES NOT AVAILABLE**

There will be spill situations where dispersant use may be appropriate but weather conditions and available resources will not allow dispersants to get on the oil within the appropriate weather window. In these cases, dispersant use will need to be abandoned and other response options considered instead.

Go to **Box 1c**

BOX 6**FOSC CAN USE DISPERSANTS****DISPERSANTS APPROVED FOR USE BY THE FOSC NEED TO BE APPLIED
USING THESE RRT IX GUIDELINES:**

- ☐ Pre-approval zones are only in waters no closer than 3 nautical miles from the nearest shoreline, not within 3 miles of the CA/OR or CA/Mexico borders, and not within the boundaries of a National Marine Sanctuary.
- ☐ Dispersants cannot be applied to any diesel spill in the San Diego Area Contingency Plan area.
- ☐ The SMART controller/observer should be over the spray site before the start of the operation. If possible, a DOI/DOC-approved marine mammal/turtle and pelagic/migratory birds observation specialist (see **Appendix E.2** for list) will accompany the SMART observer. However, the operation will not be delayed for either function.
- ☐ The marine wildlife observer, or the person functioning as that observer, is very strongly encouraged to use the Wildlife Observation Report Form (**Appendix D.9**) and the Wildlife Spotting Protocols (**Appendix E**).
- ☐ Personnel protective equipment for personnel on-site will conform to the appropriate dispersant's Material Safety Data Sheet (MSDS).
- ☐ Dispersant application aircraft will maintain a minimum 1000-foot horizontal separation from rafting flocks of birds. Caution will be taken to avoid spraying over marine mammals and marine turtles (see **Appendix A** for resource agency contact information).
- ☐ If the dispersant application platform is a boat, see Discussion Note 8.3.

BOX 6a**INITIATE PUBLIC COMMUNICATIONS PLAN**

Once a decision to use dispersants is made, it is critical that a public communications plans be implemented (**Appendix F**). The general public as well as stakeholders must be made aware of any decision to use dispersants and a mechanism created for reliable and continuous updates.

An initial press conference should be held which outlines the decision to use dispersants, provides background and scientific information, and addresses any other environmental and safety considerations expressed by the public. A sample press release is in **Appendix F.1**, with other public meeting and risk communication tips offered throughout **Appendix F**.

A public meeting should be scheduled as soon as possible to provide a mechanism for sharing information and addressing public concerns and fears. **Appendix F** provides guidelines for preparing and conducting a public meeting. Areas that must be adequately addressed during the meeting include:

- Seafood tainting concerns posed by dispersants (**Appendix G**).
- Risk communication (**Appendix F.2 and Appendix G**).
- Results of net environmental benefit analyses, and species of special concern (summarized in **Appendix B**).
- Monitoring policies established for the spill (tools used from **Appendix D**).

BOX 6b**IMPLEMENT SEAFOOD TAINTING PLAN IF NECESSARY**

Refer to **Appendix G** for key points to consider regarding seafood tainting, as well as information on accessing NOAA and state resources for assessing the tainting risk.

BOX 7**FOSC SHOULD EVALUATE PRESENT CONDITIONS FOR EXCEPTIONS TO
ENVIRONMENTAL TRADEOFFS (NEBA)**

This FOSC Checklist applies only to those California offshore waters pre-approved for dispersant use (waters 3 – 200 nautical miles from shore, not within a National Marine Sanctuary, and not within 3 miles of the CA/OR or CA/Mexico borders); see **Box 4**. However, dispersant use even in the pre-approval areas must follow certain guidelines (**Box 6**) and may be further limited by federal agencies with responsibility for endangered marine animal management (**Appendix J**).

Pre-approval dispersant zone recommendations do not presume the absence of sensitive species, other marine species, or impacts to species on the water surface or in the upper water column. It does presume that there will be impacts from the spilled oil, and from dispersant use, to some of those species. However, based on the natural resource information used in the planning stage, it was determined that there could be a net environmental benefit to the use of dispersants.

However, at the time of an actual spill and a decision to use dispersants, real-time information on marine animal presence (**Box 1b** and **Box 7b**), the potential impacts from the spill (**DISPERSANT ASSESSMENT WORKSHEET**), and important supplemental information (**Appendix B** and **Boxes 7a-b**) should all be considered and weighed by the FOSC in making a final decision to use dispersants, probable impacts, and where the net environmental benefits will occur.

The FOSC may use the regional sensitive species and habitat information from **Appendix B** for each major coastal area in which dispersant use may have an impact in order to consider:

- ☐ The type and value of habitat potentially affected.
- ☐ The sensitivity of affected resources to oil, and to different oil response strategies.
- ☐ Natural recovery rates of affected species and habitats.
- ☐ Likely oil persistence and degradation rates with and without dispersant use.
- ☐ Potential oil toxicity on surface water species compared to water column and/or seafloor species.

Dispersant use is generally not appropriate in areas with limited water circulation and flushing, near aquaculture facilities, shellfish beds and fish-spawning grounds, and around seawater intakes.

The central question to be answered in assessing Net Environmental Benefit is:

Will dispersant use significantly reduce the impact of the spilled oil?

- Rapid decisions on use are essential as dispersant must be applied quickly to be effective.
- Decision-makers must consider the various environmental, social, economic, political and cultural factors unique to each spill.
- Tradeoffs will be necessary, as no response is likely to satisfy all parties and protect all resources. The ecological impacts of oil are generally longer-lasting and more persistent than most other impacts.
- Ecological effects will be due primarily to the spilled oil. Dispersant applied at recommended rates is unlikely to cause significant adverse effects, even in multiple applications.
- Oil dispersed into water depths greater than 10m will quickly dilute to levels where acute toxic effects are unlikely.
- Few acute toxic effects have been reported for crude oil dispersed into less than 10m of well-flushed water.
- Small spills of light fuels seldom require dispersant use.

BOX 7a**REGIONAL SENSITIVE SPECIES AND HABITAT INFORMATION FROM NEBA**

At the time of an actual oil spill or a decision to use chemical dispersants on the oil, marine species are expected to be on the water surface or in the upper water column. Before using chemical dispersants, the FOSC will have decided that there may be a net environmental benefit from dispersant use. Information on regional sensitive species and habitat information from the Net Environmental Benefit Analyses (NEBA), summarized for each region in **Appendix B**, can help the FOSC determine which species might actually be in the area and scouted for by the aerial observers (**Box 1b** and **Box 7c**). This additional information can provide further validation and justification to a FOSC that impacts of chemical dispersant application will be minimized wherever possible, and net environmental benefit maximized.

BOX 7b**MARINE ANIMALS INFORMATION FROM AERIAL WILDLIFE SPOTTERS**

The FOSC can take additional information and advantage from the Aerial Wildlife Observers if they have been deployed (**Box 1b**), or information from the Wildlife Aerial Survey Form (**Appendix D.9**) available from other aerial spotters, or information from wildlife spotters (**Appendix E.2**) available to the FOSC from other data collection forms or notes used by those spotters. Any of these resources will provide real-time or near real-time information on marine seabird and mammal presence, and can guide the FOSC on dispersant application parameters that may minimize impacts to those resources.

BOX 8**APPLY DISPERSANTS AND INFORM RRT**

- ☐ Use the information on estimated oil spill volume from the DISPERSANT ASSESSMENT WORKSHEET and Discussion Note 8.1 below to:
 - Determine the dispersant application ratio (usually 1:20), and
 - Calculate the volume of dispersant required (**Appendices D.1 and D.2**).
- ☐ Record the details on the Dispersant Application Summary Form (**Appendix D.4**);
- ☐ Mobilize application team;
- ☐ If not already done, mobilize SMART. Some blank SMART forms are included in **Appendix D** for use by other trained professionals, if appropriate and when approved by the FOSC.
- ☐ Inform RRT (see **Appendix A** for contact information).

Decision: Dispersants applied?

- ☐ Yes Go to **Box 9**
- ☐ No Explain.

Make a note of the decision on Dispersant Use Checklist (Page I-8)

Reassess as necessary and appropriate.

Discussion Note 8.1**GENERAL APPLICATION INFORMATION**

- The FOSC has final responsibility for operational aspects of dispersant applications.
- Dispersant must only be applied by experienced spray applicators and in accordance with manufacturer instructions.
- The persons applying dispersant are responsible for the calibration and operation of the spraying system, and the safety and maintenance of the application platform.
- Droplet size is the key variable influencing dispersant effectiveness. Undersized droplets (*e.g.*, fog or mist) will be lost through drift and evaporation. Oversized droplets will punch through the oil and be lost in the water column.
- Dispersants pre-diluted in water are less effective than undiluted dispersant.
- Only undiluted concentrate dispersant is applied from aircraft. Dispersant should, where possible, be applied into the wind and parallel with the slick.
- Dispersant should be applied in a methodical and continuous manner to ensure the entire target area is treated.
- Spraying effort should concentrate on the thickest sections, and/or the leading edges, of oil that threaten sensitive areas.
- Thick portions of the slick may require several applications.
- Oil sheen should not be sprayed with dispersant.

Regarding the relationship between Dispersant-to-Oil Ratio (DOR) and the concentration of oil being treated:

- Regardless of DOR ratios suggested by dispersant manufacturers, there are many factors that influence dispersibility (*e.g.*, oil characteristics, degree of weathering, water salinity, sea state) that may make it very difficult to select an appropriate DOR for the conditions faced on the day of a specific spill
- The variability of slick thickness (or oil concentration) is such that one can never really characterize the actual oil concentration for more than a few seconds within the speed and swath constraints of a particular application system.
- With most application systems, one is usually overdosing and underdosing as the system moves through light, heavy and sometimes “no” oil on the water surface.
- The best estimate of the average oil thickness (or average volume of oil per unit area) must be used.
- Given that precise spray parameters are extremely difficult to achieve, dispersant applicators generally use about 5 gallons of dispersant per acre on their first run.
- Area, volume and thickness can be related with the following expression:

$$10^4 \times \text{Area (hectare)} \times \text{Thickness (mm)} = \text{Volume (liters)}$$

or

$$\text{Volume (liters/Area (hectares))} = 10^4 \times \text{Thickness (mm)}$$

- ▶ To convert liters/hectare to gallons/acre, multiply by 0.107. To convert liters/hectare to gallons/square kilometer, multiply by 26.42.
- ▶ These values (in any units) multiplied by the DOR (as a fraction, *e.g.*, 1:5 = 1/5 or .2) will then yield the Desired Dosage (in those units) for that value of DOR.
- ▶ Refer to Appendix D.1 for some pre-calculated values.

From Cawthron, 2000 and Al Allen (Spilltec), 2003 personal communication

Discussion Note 8.2**AERIAL APPLICATION**

This general aerial application guide is intended simply to highlight key issues. The FOSC will coordinate and oversee operational aspects of aerial dispersant applications.

- Aircraft applications should always include pump-driven spray units.
- Dispersant droplet size should be between 400 and 1000 microns.
- Commercial aircraft spray nozzles generally range between 350 and 700 microns.
- 1000-micron spray nozzles may be needed for use on viscous oils.
- Nozzles should achieve an application rate of 5.3 gallons per acre if using a 1:20 ratio.
- Spray nozzles should be installed to discharge directly aft.
- Underslung buckets on helicopters should be mounted so the pilot can see the ends of the spray booms in flight.
- The altitude of the aircraft should be as low as possible.

From Cawthron, 2000

Discussion Note 8.3**BOAT APPLICATION**

- Spray booms should be mounted as far forward as possible to prevent oil being moved aside by the bow wave before being sprayed. This then uses the mixing energy of the bow wave to break up the oil.
- Spraying systems should be set so that the spray pattern is flat, striking the water in a line perpendicular to the direction of the boat's travel.
- The fan-shaped sprays from adjacent nozzles should be set as low as possible, overlapping just above the oil/water surface, with the inboard spray striking the hull just above the waterline.

Undiluted dispersants

- Air blast sprayers and modified spray pumps can be used to apply undiluted concentrated dispersants and conventional dispersants.
- Treatment rate is usually constant and determined by nozzle size and spray pressure.
- Calibration and use of an appropriate droplet size is critical to effective applications.

Pre-diluted dispersants

- Concentrated dispersants can be applied after pre-dilution in seawater, but will be less effective.
- The dispersant : water ratio should be equal to, or greater than, 10%
- Applications through ship's fire-fighting equipment are controlled by opening or closing the dispersant supply. Vessel speed is used to control the treatment rate.
- Dual pump systems for dispersant and seawater-supplying spray booms allow the dilution rate to be adjusted.
- Boat speed is the main determinant of dispersant dose rate (reduce boat speed to increase the dose rate).
- Boat speed should be in the order of 5 knots for fresh spills of liquid crude or fuel oil, which assumes that the oil has spread to 0.1 mm thick.
- With reduced boat speeds, the required application rate per acre or km² can be maintained by reducing pump speed.

The following ASTM standards apply to systems involving spray arms or booms that extend over the edge of the boat and have fan-type nozzles that spray dispersant in a fixed pattern:

- ASTM F 1413-92: Standard Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems
- ASTM F-1460-93: Standard Practice for Calibrating Oil Spill Dispersant Application Equipment Boom and Nozzle Systems
- ASTM F 1737-96: Standard Guide for use of Oil Spill Dispersant Application Equipment During Spill Response: Boom and Nozzle Systems.

Boat-based systems using a fire monitor and/or fire nozzle shall avoid a straight and narrow "firestream" flow of dispersant directly into the oil. There are no applicable ASTM standards for these systems at this time (December 2003).

In part from Cawthron, 2000

BOX 9**ARE THERE INDICATIONS THE DISPERSANT IS EFFECTIVE?**

- ☐ Acquire information from dispersant monitoring team (SMART team or other FOSC-designated monitors).
- ☐ Review dispersant monitoring results after each dispersant application.
- ☐ Determine if chemical dispersion is significantly greater than natural dispersion.
- ☐ Assess whether changing application parameters could make the application more effective.

Decision: Are there indications the dispersant is effective?

- ☐ Yes Go to **Box 10**
- ☐ No See Discussion Note 9.2 and return to **Box 8**, or Go to **Box 12**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

From Cawthron, 2000

Discussion Note 9.1**ASSESSING DISPERSANT EFFECTIVENESS**

- Dispersant applications must be monitored to confirm whether or not dispersant use is effective, and to determine the fate and transport of treated oil.
- Dispersant applications should not be delayed simply because monitoring is not in place.
- Visual observation is the minimum level of monitoring. Observations teams may use the forms in **Appendix D**.
- There will be very few instances where a dispersant application is possible but visual monitoring is not.
- Because dispersed oil plumes are often highly irregular in shape and thickness, it can be difficult to accurately estimate dispersant efficiency.
- The appropriate dispersant application dose depends on the oil thickness (see **Appendices D.1 and D.2** for common dose rates based on oil thickness). Slicks are generally not of uniform thickness, and it is not always possible to distinguish among thicker and thinner portions of the same slick. It is therefore possible to apply too much or too little dispersant to some parts of a slick. Because over- and under-dosing can lead to variations in effectiveness, these variations should be noted.
- On-site monitoring of oil dispersed in the water column should support visual monitoring whenever possible. See **Appendix D** for additional information and forms.
- Decisions to terminate operations due to poor effectiveness should ideally be based on on-site monitoring results.
- A visible coffee-colored cloud in the water column indicates the dispersant is working.
- A milky-white plume in the water column can indicate excessive dispersant application.
- When dispersant is working, oil remaining on the water surface may also change color.
- A difference in the appearance of treated and untreated slicks indicates dispersion is likely.
- Absence of a visible cloud in the water column makes it difficult to determine whether the dispersant is working. When the water is turbid, you may not be able to see a plume. Oil remaining at the surface and sheens can also obscure an ability to see oil dispersing under the slick.
- Successful dispersion can occur with no visible indication of dispersion.
- A subsurface plume may not form instantly once dispersant has been applied. In some cases (*e.g.*, emulsified oil) it can take several hours for a plume to form. In other cases, a visible plume may not form, and you may wish to use sampling to learn whether dispersion has occurred.
- Boat wakes may physically part oil, falsely indicating successful dispersion. Mechanically dispersed oil will re-coalesce and float to the surface.
- Dispersants sometimes have a herding effect on oil after initial applications, making a slick appear to be shrinking when, in fact, the dispersant is “pushing” the oil together. The effect results from the surfactants in the dispersant, which causes a horizontal spreading of thin oil films. This can cause parts of a slick to seem to disappear from the sea surface for a short time.

From Cawthron 2000 and NOAA Oil Spill Job Aids

Discussion Note 9.2**WHEN DISPERSANT IS NOT EFFECTIVE**

If monitoring shows dispersion does not appear effective, review all aspects of the application and monitoring for possible reasons why. Aspects to consider include:

- Dispersant formulation
- Application ratios (increase or decrease oil: dispersant ratio)
- Application methods
- Monitoring methods
- Interpretation of monitoring results
- Oil weathering
- Weather conditions

From Cawthron, 2000

BOX 10**IS ONGOING DISPERSANT USE JUSTIFIED AND SAFE?**

All of the following must apply to justify ongoing dispersant use:

- ☐ The spill can be chemically dispersed with an approved and available agent (see **Box 2** and **Appendix H**); Oceanographic and weather conditions are potentially conducive to dispersant use (see **Box 3** and DISPERSANT ASSESSMENT WORKSHEET);
- ☐ The spilled oil is at least 3 nautical miles from shore, not within the boundaries of a National Marine Sanctuary (see **Box 4**), and not within 3 miles of the CA/OR or CA/Mexico borders;
- ☐ The dispersant will have a net environmental benefit (see **Box 7a**);
- ☐ The dispersant can be applied safely (see **Box 5**), with suitable weather (**Box 5a**) and available resources (**Box 5b**);
- ☐ There are indications the dispersant continues to be effective (see **Box 9**).

Decision: Continue with dispersant use?

- ☐ Yes Go to **Box 11**
- ☐ No Go to **Box 12**

Make a note of the decision on Dispersant Use Checklist (Page I-8)

THERE WILL BE A POINT WHEN DISPERSANTS ARE NO LONGER EFFECTIVE.

BOX 11**CONTINUE TO MONITOR APPLICATION PARAMETERS AND RUN
ADDITIONAL DISPERSANT SORTIES AS NECESSARY**

More than one dispersant sortie (run) may be necessary to effectively treat the oil spill. Continue to monitor information on the spill extent, dispersant effectiveness, continued availability of suitable weather “windows” and dispersant application equipment and personnel, and perform addition applications as necessary.

- ☐ Record information from each sortie on the Dispersant Decision Summary.
- ☐ Inform RRT when all runs are completed (fax Dispersant Decision Summary form to RRT contacts in **Appendix A**).

THERE WILL BE A POINT WHEN DISPERSANTS ARE NO LONGER EFFECTIVE.

BOX 12**DO NOT USE DISPERSANT**

Pre-approval to use dispersants does not apply if **any** of the following occur:

- ☐ The spill cannot be chemically dispersed with an approved and available agent (see **Box 2** and); Oceanographic and weather conditions are not potentially conducive to dispersant use (see **Box 3** and DISPERSANT ASSESSMENT WORKSHEET);
- ☐ The spilled oil is closer than 3 nautical miles from shore, within the boundaries of a National Marine Sanctuary (see **Box 4**), or within 3 miles of the CA/OR or CA/Mexico borders. Approval to use dispersants within 3 miles of landfall or CA borders, or within a National Marine Sanctuary, does not fall within the Pre-Approval guidelines, and will instead need to be considered under the RRT Approval Process (see **Box 4a** and **Appendix I**);
- ☐ The dispersant will not have a net environmental benefit (see **Box 7a**);
- ☐ The dispersant cannot be applied safely (see **Box 5**), with suitable weather (**Box 5a**) or available resources (**Box 5b**);
- ☐ The dispersant is not significantly more effective than natural dispersion or other response options (see **Box 9**).

IF DISPERSANT USE IS CONSIDERED INAPPROPRATE, CONSIDER OTHER RESPONSE OPTIONS.

Go to **Box 1a**.

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- Yender, R., J. Michel, and C. Lord. 2002. Managing Seafood Safety After an Oil Spill. Seattle: Hazardous Materials Response Division., Office of Response and Restoration, National Oceanic and Atmospheric Administration. 72 pp.

Resources from Internet World Wide Web sites:

NOAA Oil Spill Job Aids
(web links of 12/18/03)

http://response.restoration.noaa.gov/job_aid/glossary.html
<http://response.restoration.noaa.gov/oilaid/spiltool>
http://response.restoration.noaa.gov/disp_aid/remember.html
http://response.restoration.noaa.gov/disp_aid/checklist.html
<http://response.restoration.noaa.gov/oilaid/OilatSea.pdf>
<http://response.restoration.noaa.gov/oilaid/SMART/SMART.html>